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ROAD TRAFFIC NOISE IN URBAN ENVIRONMENTS IN AHVAZ CITY, IRAN

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ABSTRACT

Noise pollution because of physiological and psychological effects on human is one of the importance environmental pollutants. The most important sources of this pollution are transportation and car traffic. The present study was implemented with an overall goal of assessment of noise pollution from traffic in Ahvaz, Iran in 2012. In this descriptive study, 7 roads of the main routes of Ahvaz which have high density of traffic are selected and 134 measuring stations were chosen. At measuring stations, 4 days of week, three time period, and 1523 measurements were recorded totally. Each measurement was recorded for 30 minutes. After transferring data to computer, SPSS and Excel software were applied for statistical analysis; also T-test and ANOVA were used for statistical tests. According to result this study the average of equivalent sound pressure level in all stations is equal to 76.28 ± 3.12 dB. There was a statistically significant difference between the mean values of equivalent sound pressure level on different roads, different weekdays and various daytimes ($P<0.05$). According to the results, it was found that Ahvaz has a higher noise pollution in comparison with outdoor permissible limit standard in Iran. So, it should seriously be taken into consideration in order to control noise and prevent the effects.

KEYWORDS:
Noise pollution, Noise Index, Traffic, Ahvaz, Iran.

INTRODUCTION

Developing industrial cities and tendency to live in large cities have caused people in metropolises face a number of problems [1-4]. Among the problems that can endanger human serenity and health is noise pollution [5-7]. According result different studies number of person's exposure to railway, aircraft and industry noise affects are 16, 4 and 1 million persons [5-7]. Exposure to road traffic noise can be cusses numerous adverse health endpoints [8-13]. The main sources of noise pollution are traffic and transportation [14-16]. The capital of Khuzestan province with a population of 1.2 million persons and area of 140 square kilometers is Ahvaz city [17-20]. Significant urban and industrial developments and the growth of universities have increased transportation on roads and routes so that the total number of vehicles (including bicycles, motorcycles, talkies, cars, trucks, heavy vehicles, etc.) is over 336710, which caused different kinds of pollution especially noise pollution in different parts of the city [21]. In megacities at developed country one of most important major source of community noise, especially near a highways is the road traffic. Result of several studies demonstrated the impact of this highway and road nuisance [22,23]. In the Gomez article, noise pollutions from traffic were discussed as a factor of society health level reduction [24]. Also, in another study in Zanjan, Iran L_{10}, L_{50}, L_{90}, SPL and NPL indexes are evaluated and showed a noise level above the standard in different parts of the city [25]. Another study by Rahmani et al. in 2011 evaluated noise level and developed two noise determinations, which showed noise level above

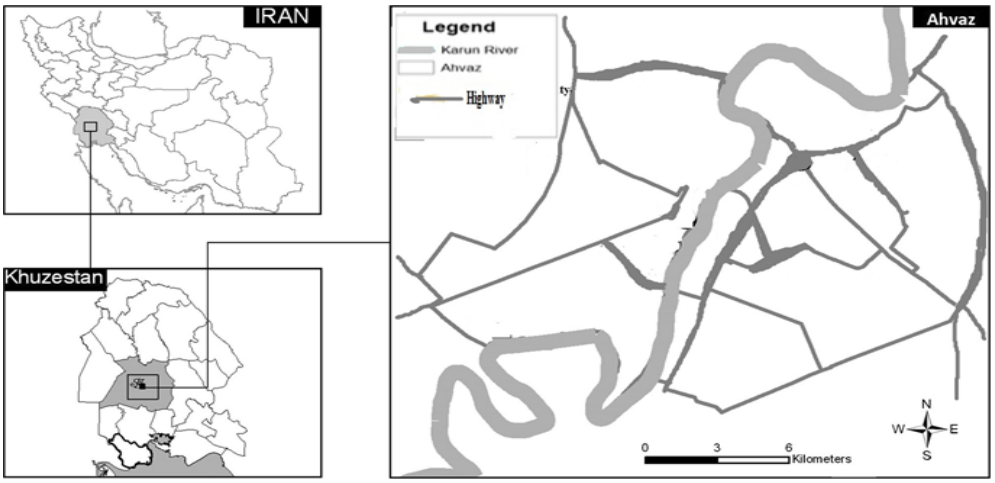

FIGURE 1
Mapping of Ahvaz with location of measuring stations

standard in Iran [26]. In another study, Lee and et al, evaluated the model road traffic noise levels and estimate the human exposure at 25 districts in the metropolitan Seoul, Republic of Korea [27]. Pichai analyzed and assessed the effect of traffic noise at motorway in newly expanded Bangkok-Chonburi [28]. Another study to evaluate noise levels in Jordan showed that influential factors on noise levels are traffic density, speed, honking, and number of lines, line widths, road slope and pavement [29]. Gundoghu et al showed that the average and maximum day noise level in Erzurum, Turkey was above standard [30]. The results of a study modeling of Road traffic noise in Brazil in 2003 indicated that people who live or work nearby these roads, experience above standard noise levels [31]. Also the result of a study conducted by Ali and Tamura in Cairo, Egypt, showed above the standard noise level [32]. One cross-sectional study has found a higher but non-significant prevalence of hypertension among male workers exposed to noise levels at frequencies of 2000, 4000 and 8000 Hz [33].

The main purpose of this study was the evaluation of noise pollution from the traffic of Ahvaz, Iran during the year 2012 and comparing the results with standards.

MATERIALS AND METHODS

Study population and exposure assessment. The descriptive study assessed noise index on 7 city roads (Pasdaran and Ayatollah – Behbahani, Enghelab, shahid–Chamran and Golestan, Shariati and Azadegan) in 134 given stations in summer 2012. Squares, intersections and spots between them on these roads were under study [34-36]. Measurements were done in 4 days (Sat, Tues, Thurs, Fri) representing workdays and weekends [34]. According Environmental Protection Agency (EPA), samples were mostly gathered at rush hours based on investigations, 7-8 AM, 12-13 PM and 8-9 PM. [37,38]. Noise levels were determined by CEL/450 scales which are accurate and made based on international standards. This device has various models and many applications, so it can measure several variables [25]. The scale was calibrated before use and when it was stopped, protective foam was used to control air effect on the microphone [39,40]. Measuring was done without catching people, pedestramts, drivers, shop keepers or landowner's attention. The scale was set at the height of 1.6m, in the position dB fast and sampling was done in 30 minutes [41-43]. All measurements were done on both sides of the roads [42,43]. The studied indexes are as follows; L_{eq} (Sound pressure Level), L_{max} (Maximum sound Pressure Level), L_{min} (Minimum sound Pressure Level) [39].

Statistical Analysis. In the present study, we used descriptive statistics (frequency, mean, and standard deviation for each variable). The data were analyzed by Excel, SPSS, ANOVA and T- test.

RESULTS AND DISCUSSION

The results showed that the average of equivalent sound level (L_{eq}) in all stations was 76.28± 3.08 dB, which was higher than the environmental standard in EPA and Iran (65dB) [44]. Also in all studied roads, days and time periods, noise level was above the standard. The minimum and maximum sound pressure Levels were 76.28±3.18 and 68.93±3.36 respectively. Pasdaran and Behbahani Highways with 73.65±6.20 and 73.09±4.20, and Shahid–chamran and Azadegan highways with 71.83±2.05 and 71.21±6.43 showed the highest and lowest average equivalent sound pressure levels, respectively. Tables 1-2 and Figure 2 show noise pollution parameters of the present study.

Also by ANOVA and T-test, there was a considerable difference between the average of

equivalent sound level at different roads, days, and time periods, on Friday and other days of the week (P<0.05). But at different stations (on squares, intersections and interval spots) no significant difference was observed between Leq.

TABLE 1
The results of measured sound parameters in Ahvaz, Iran. (2012)

Parameter / Value	L_{max}	L_{min}	L_{eq}
Min	69.12	57.25	61.21
Max	95.46	80.62	91.35
Average	84.32	68.93	76.28

TABLE 2
The average of noise pollution parameters for the studied times in Ahvaz, Iran (2012)

Parameter / Hours	L_{max}	L_{min}	L_{eq}
6-8 A.M	83.19	83.19	72.09
12-13 P.M	83.11	83.11	72.44
8-9 P.M	84.02	84.02	73.34

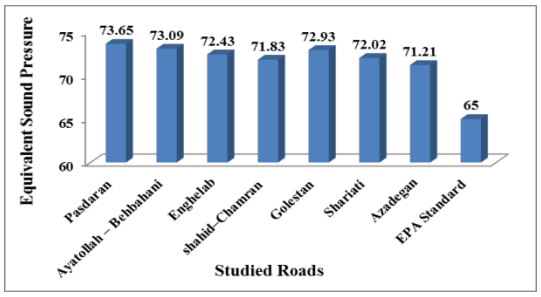

FIGURE 2
The average of Equivalent Sound Pressure Level in the studied roads

The results showed that the average of equivalent sound level at all stations was above standard (65dB). Some studies reported similar equivalent levels for traffic noise range. According to report of Babisch in 2014 there was a significant relationship between coronary heart diseases and road traffic noise. They demonstrated that per increase of the weighted day-night noise level L DN of 10 dB (A) can be increase of the relative risk of 1.08 (95% confidence interval: 1.04, 1.13) [44]. Golmahammadi (2005-2006) reported that the value for Hamadan, Iran, in all stations to be 69.04±4.25 (dB) [45]. Motallebi Kashani et al in Kashan, Iran, (2000- 2001) reported that the crowded spots hospital rooms, and residential – industrial areas were 76.7, 65.6, 56.7, 58.7 dB respectively [46]. Belojevic et al. (1977) reported that the noise level in crowded areas of downtown in Belgrad was above 65 dB (daytime equivalent level 76.5 and the night were 64.5 dB) [47]. A study conducted in Messina, Italy showed L_{eq} above 75 dB [48]. Another study reported the traffic noise level in more than 60 crowded areas in 8 cities of Nigeria by momentary sampling 24 hrs. Equivalent sound level and Maximum environmental sound levels were 84.6 and 1.5 dB in Net A respectively. High maximum environmental sound level was considered, pertain to cultural factors, including big African horns by motorcycles [49]. Alizadeh et al reported the average sound pressure indexes (L_{10} – L_{50}, L_{90} , LD) in measuring stations in Sarri, Iran, above standard (65dB) [50]. The considerable difference between the average equivalent sound level at different roads, days, time periods, on Friday and other days of the week (P<0.05), owing to the passing vehicles load and their speed mainly. Naddafi and Golmohammadi reported the same results [39,45]. Noise pollution in big cities is still a matter of serious social concern; some of whose causes could be construction and traffic engineering ones. According to the results, Noise pollution in Ahvaz, Iran is due to the old urban residential area traffic issues significantly.

CONCLUSION

According to the results, it was found that Ahvaz has a higher noise pollution in comparison with outdoor permissible limit standard in Iran. So noise pollution is a matter of serious concern and causes need to be studied. Traffic management reforms, using noise controllers, making one way streets, planting on sides of the roads to absorb the noise, locating commercial centers out of residential areas, discarding old vehicles, removing bumps, using high speed reducers such as traffic sings, speed limits and speed bumps on lowly traveled streets in order to reduce noise pollution in different areas of the city seems to be necessary.

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